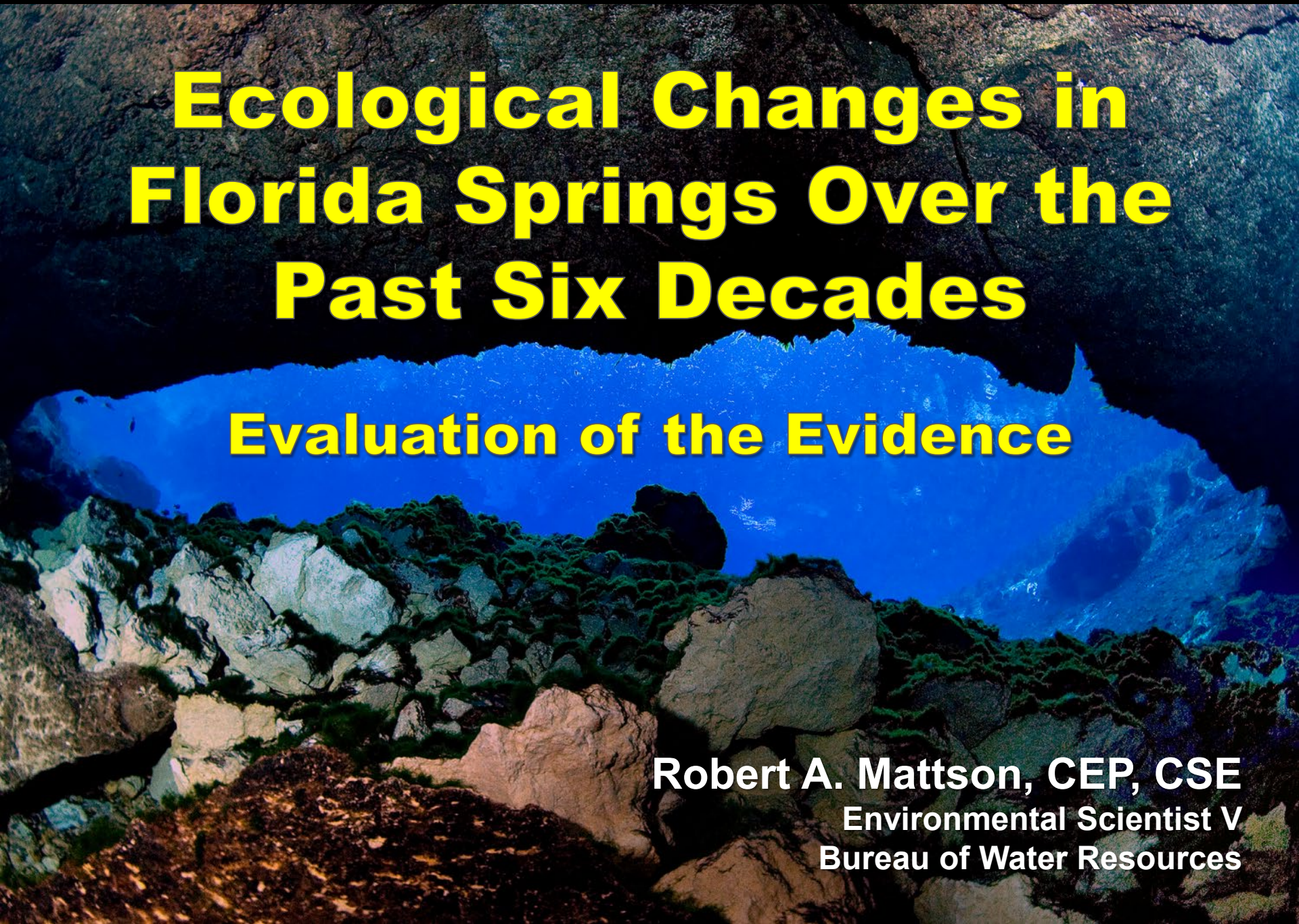


Ecological Changes in Florida Springs Over the Past Six Decades

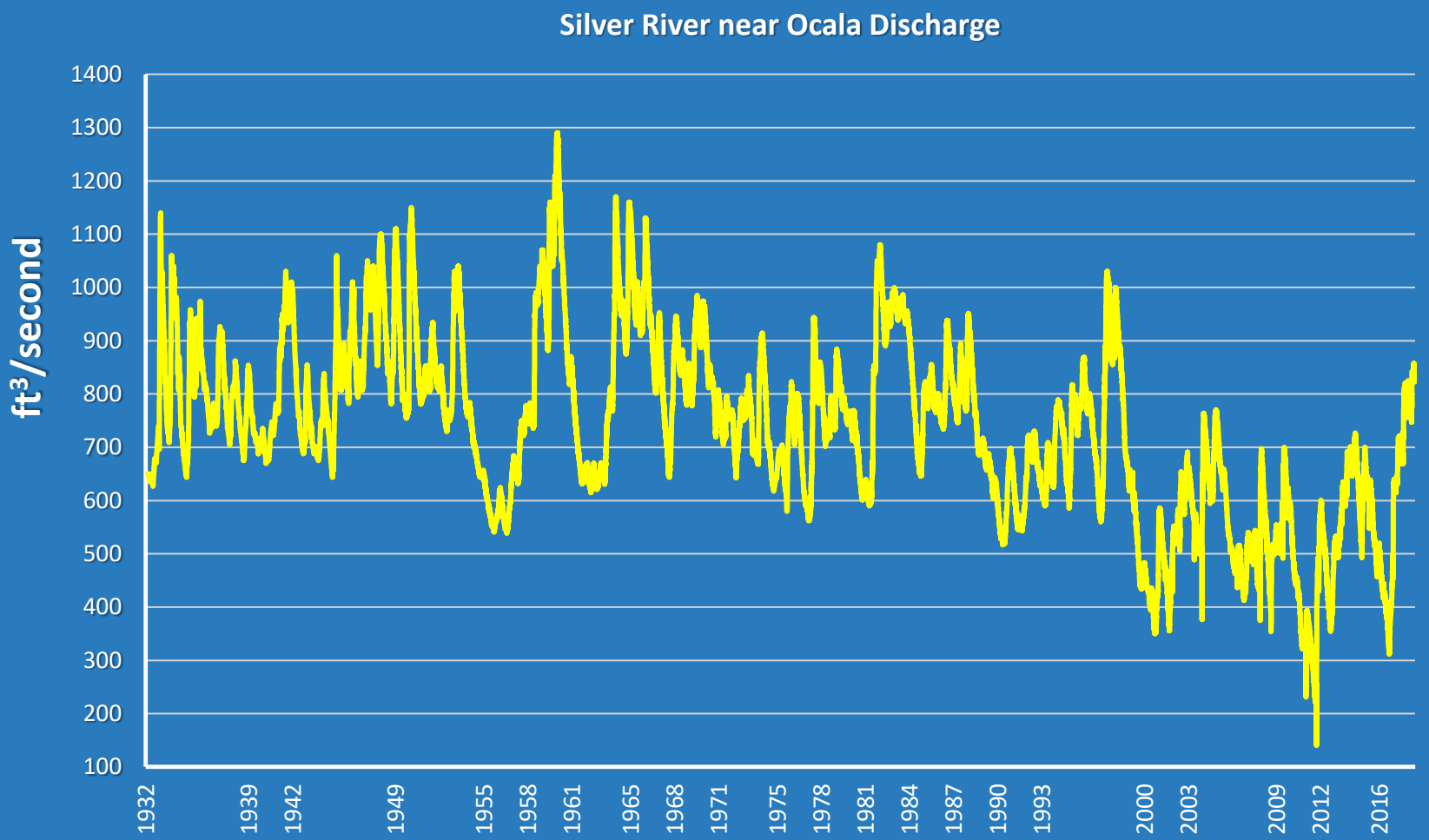
Evaluation of the Evidence

Robert A. Mattson, CEP, CSE
Environmental Scientist V
Bureau of Water Resources

Long-term Studies of Ecological/Biological Trends in Florida Spring-Run Streams

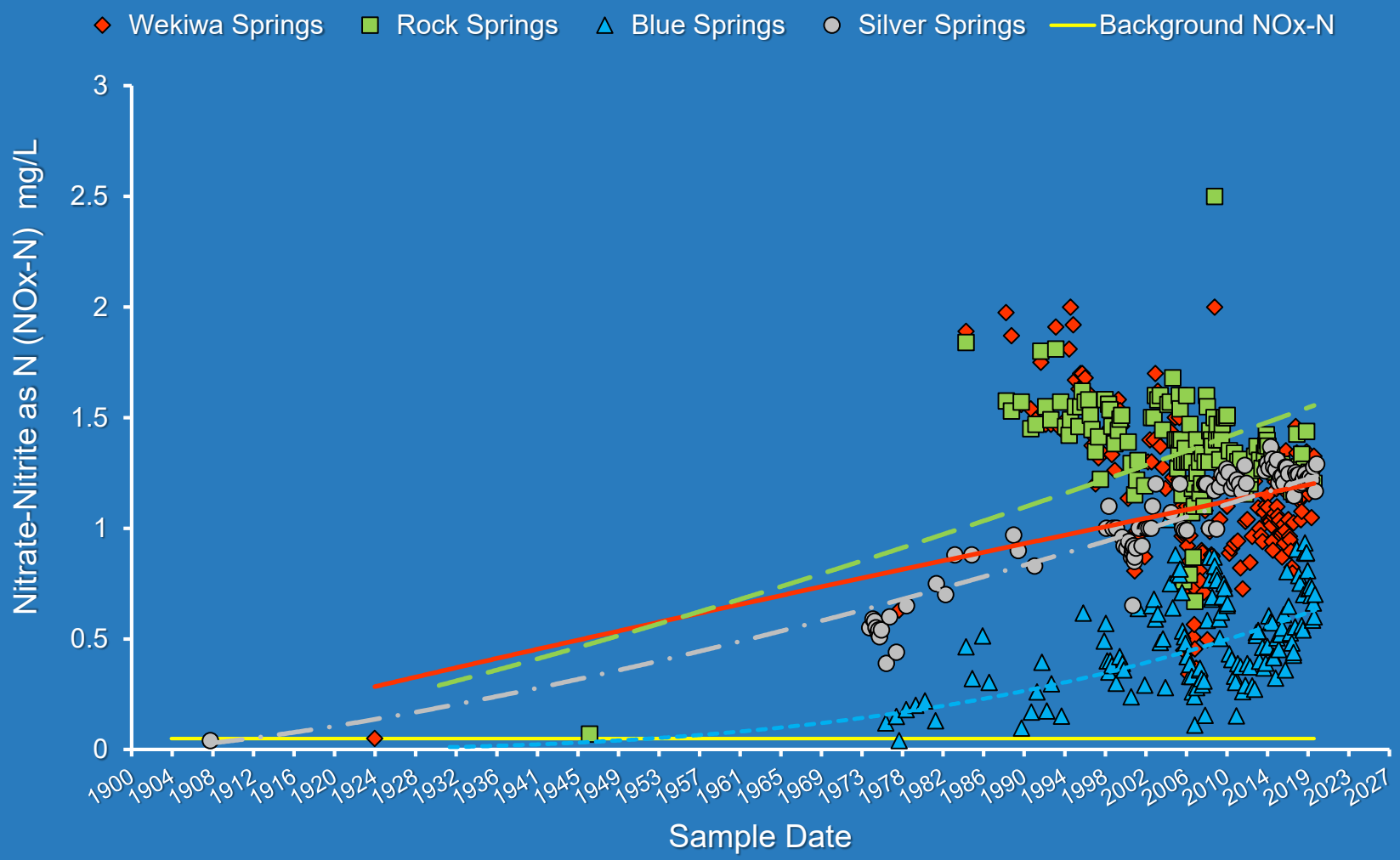
- Few
  - DEP Parks – Monitoring submerged vegetation in Ichetucknee River; manatee populations in Volusia Blue Spring
  - SJRWMD – Silver River Retrospective Study; comparison of Odum work (1950s) with conditions 2004-05. SJRWMD Special Publication SJ2007-SP4
  - SJRWMD – Comparison of submerged macrophyte communities in 14 spring-run streams in 2015 with historic studies. SJRWMD Technical Publication SJ2019-2

Spring Flow — Silver Springs



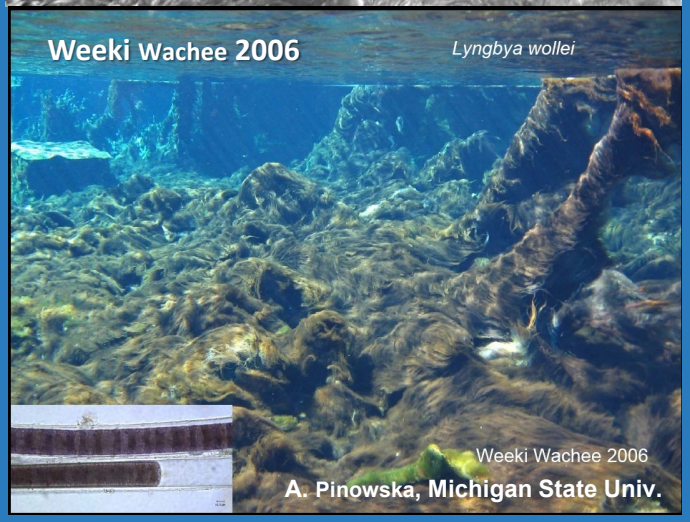
Spring Nitrate Trends

(SJRWMD, FGS and USGS data)



The Issue

Changes in Biological Communities



Objectives

- Exploratory using published work
- Compare data from selected current and historical biological surveys in springs/ spring-run streams
- Evaluate comparability of the data
- What does this tell us (trends)?
- Implications?

Comparison of Studies

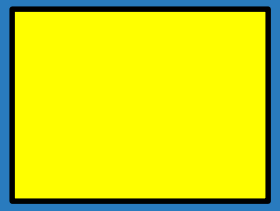
Factors considered

- Stations – geographic locations (lat/long), number of stations per spring/stream
- Field collection methods – quadrat size, number of sample replicates per site, collection methodology
- Laboratory methods (if applicable)

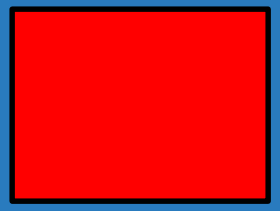
Color Key for Bar Charts

(Based on best professional judgement)

- Data appear to be comparable with good certainty



- Data moderately to marginally comparable with some uncertainty



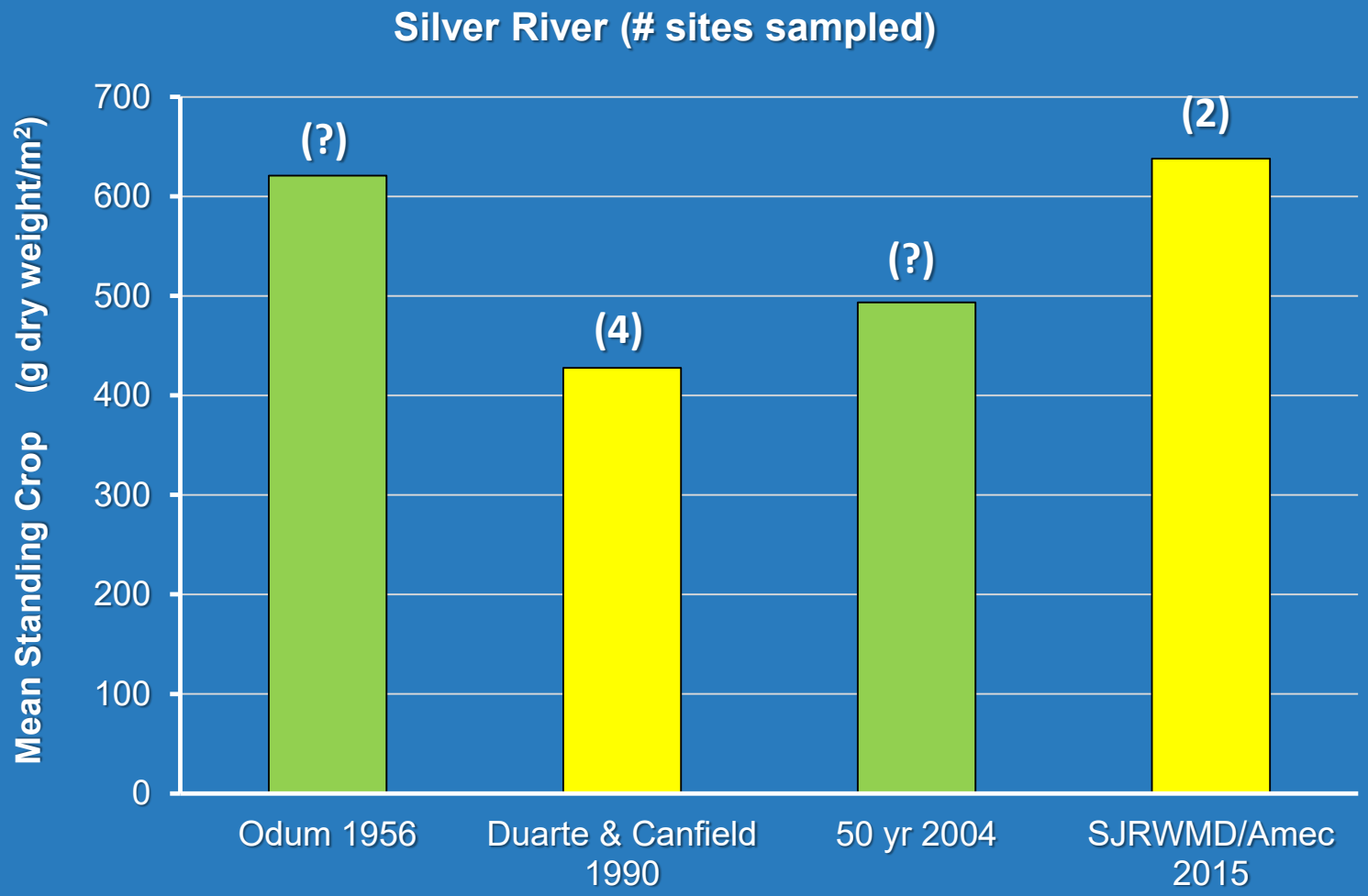
- Data not comparable with high degree of uncertainty

Submerged Macrophyte Studies

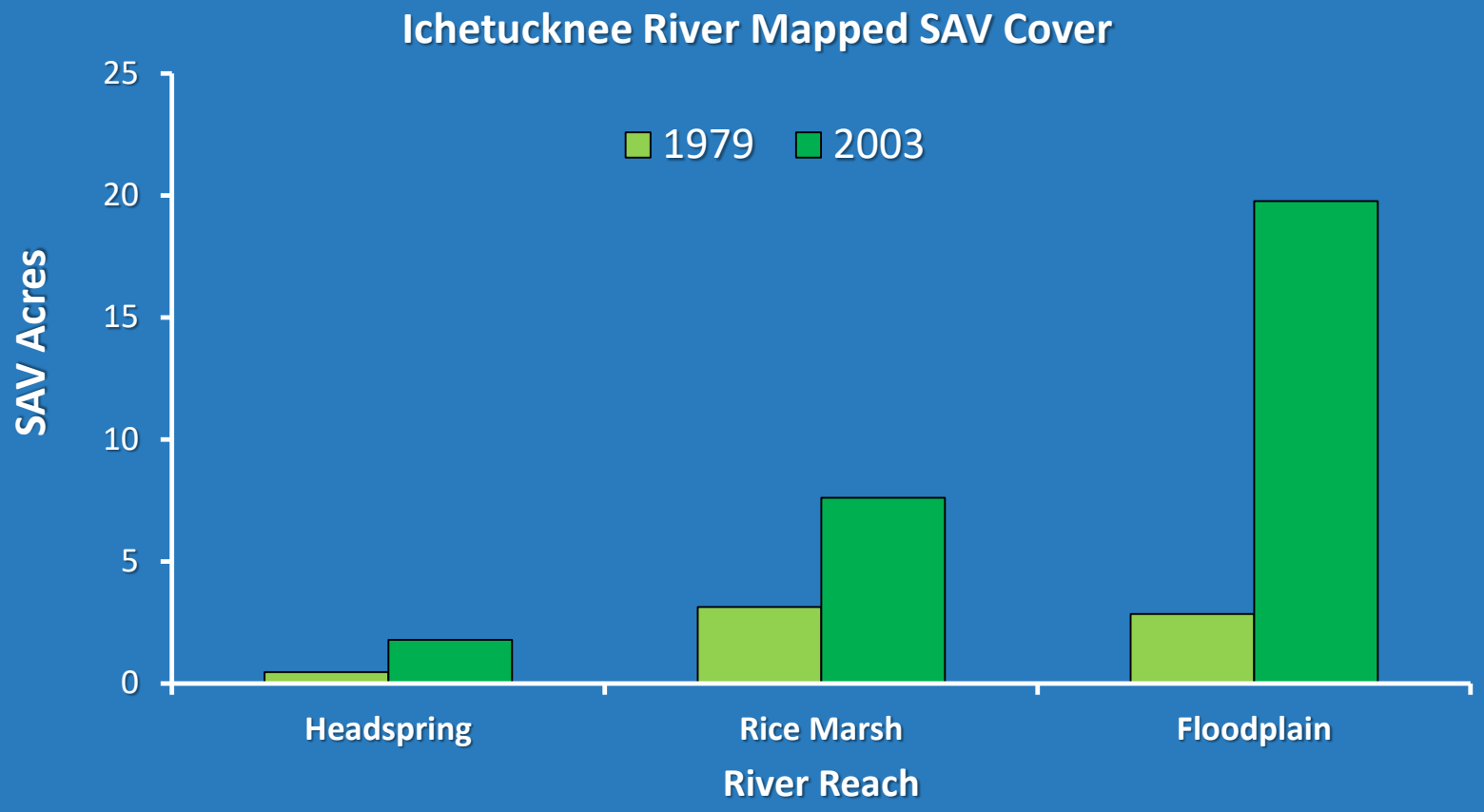
(Published studies)

	Odum 1956	Dutoit 1978	Canfield and Hoyer 1988	Duarte and Canfield 1990	PBS&J/UF 2003-04	50 yr 2004	SJRWMD/ Amec 2015
Wacissa River			XX	XX			XX
Ichetucknee River		XX	XX	XX	XX		XX
Manatee Spring				XX	XX		XX
Rainbow River				XX			XX
Weeki Wachee River				XX			XX
Silver River	XX			XX		XX	XX
Rock Springs Run				XX			XX
Silver Glen Spring				XX			XX
Juniper Creek				XX			XX
Alexander Springs Crk			XX	XX			XX
Wekiva River			XX	XX			XX

Submerged Macrophytes

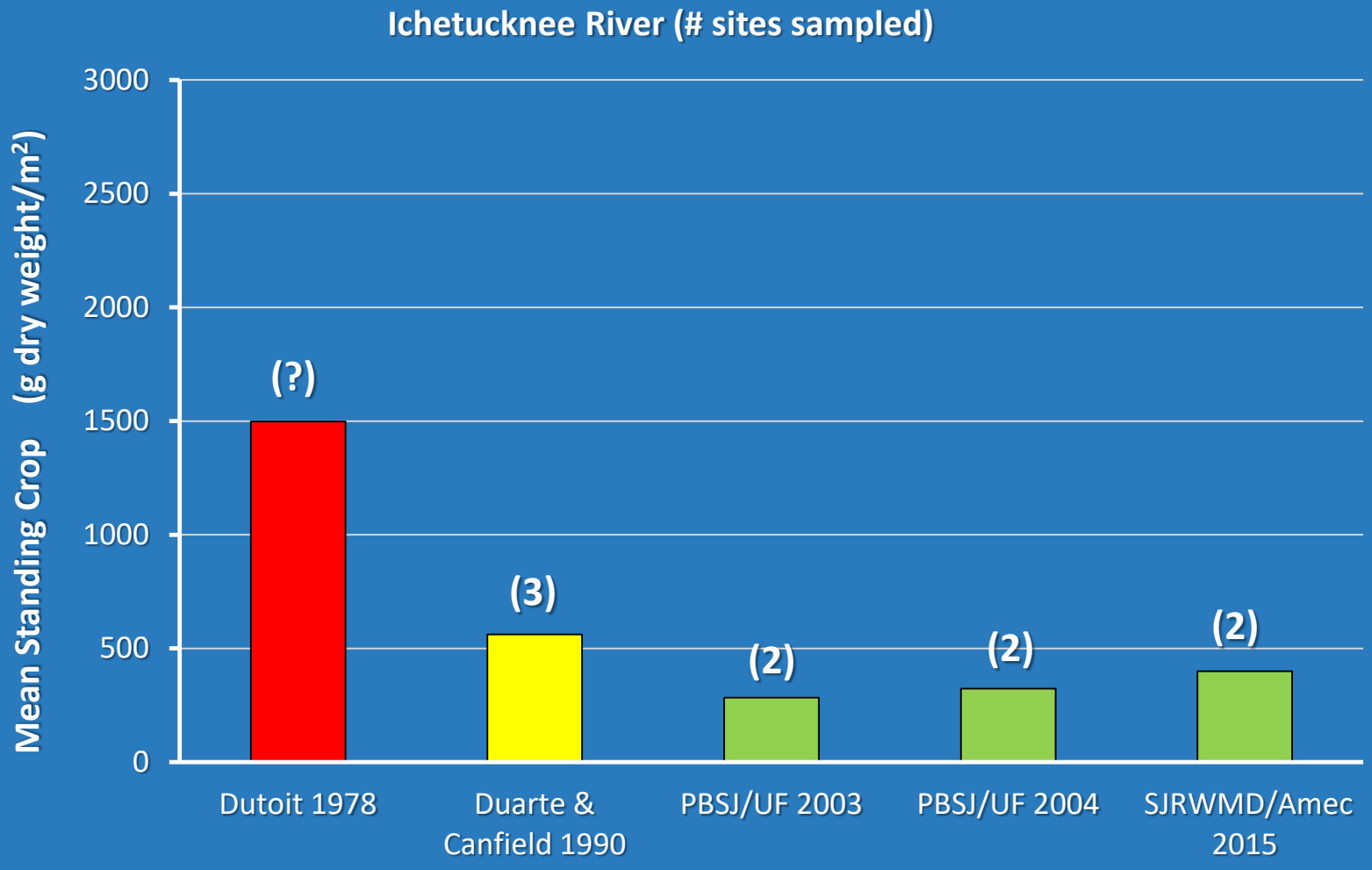


Submerged Macrophytes

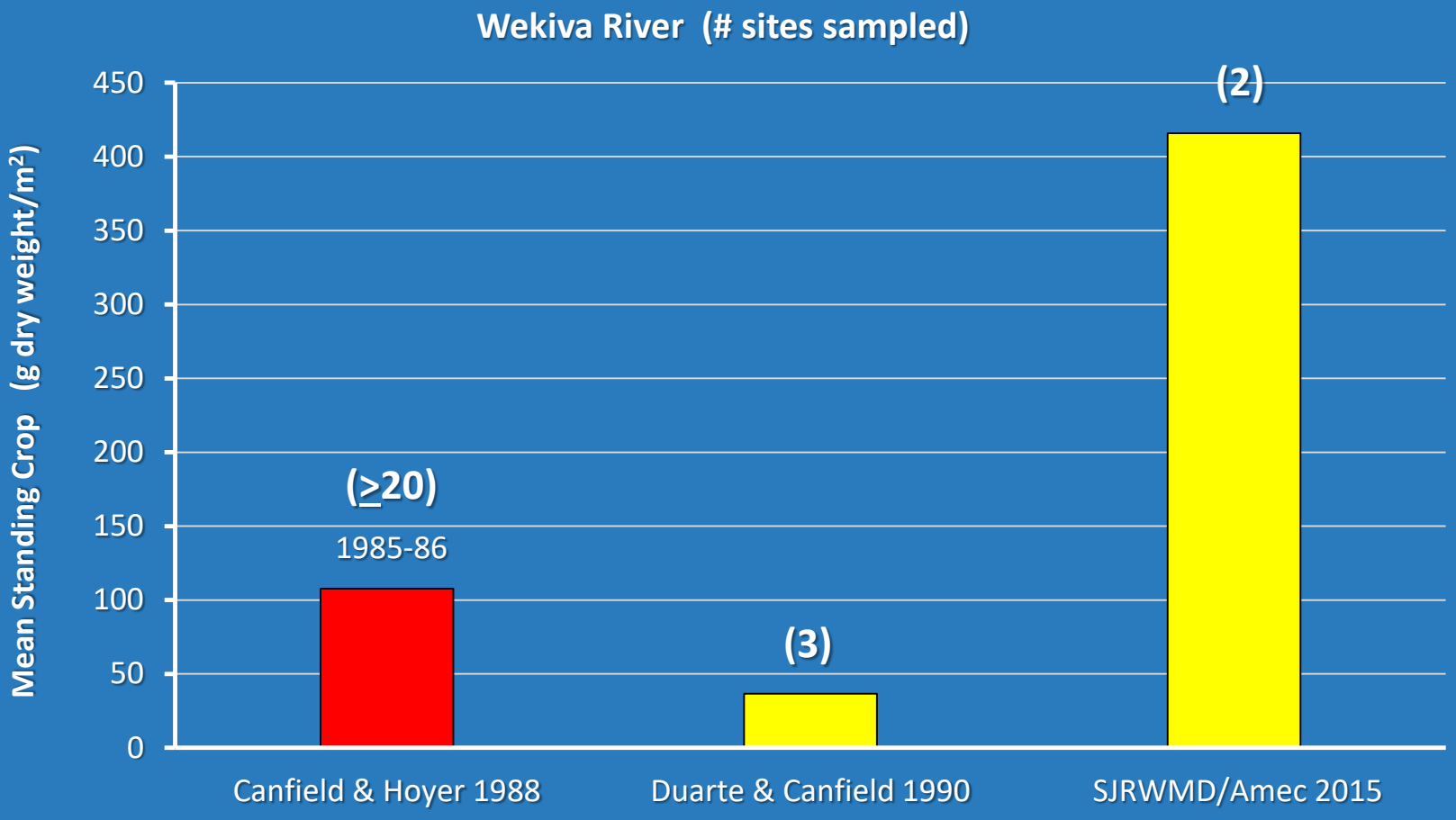


Sources: 1979-Dutoit; 2003-PBS&J/UF

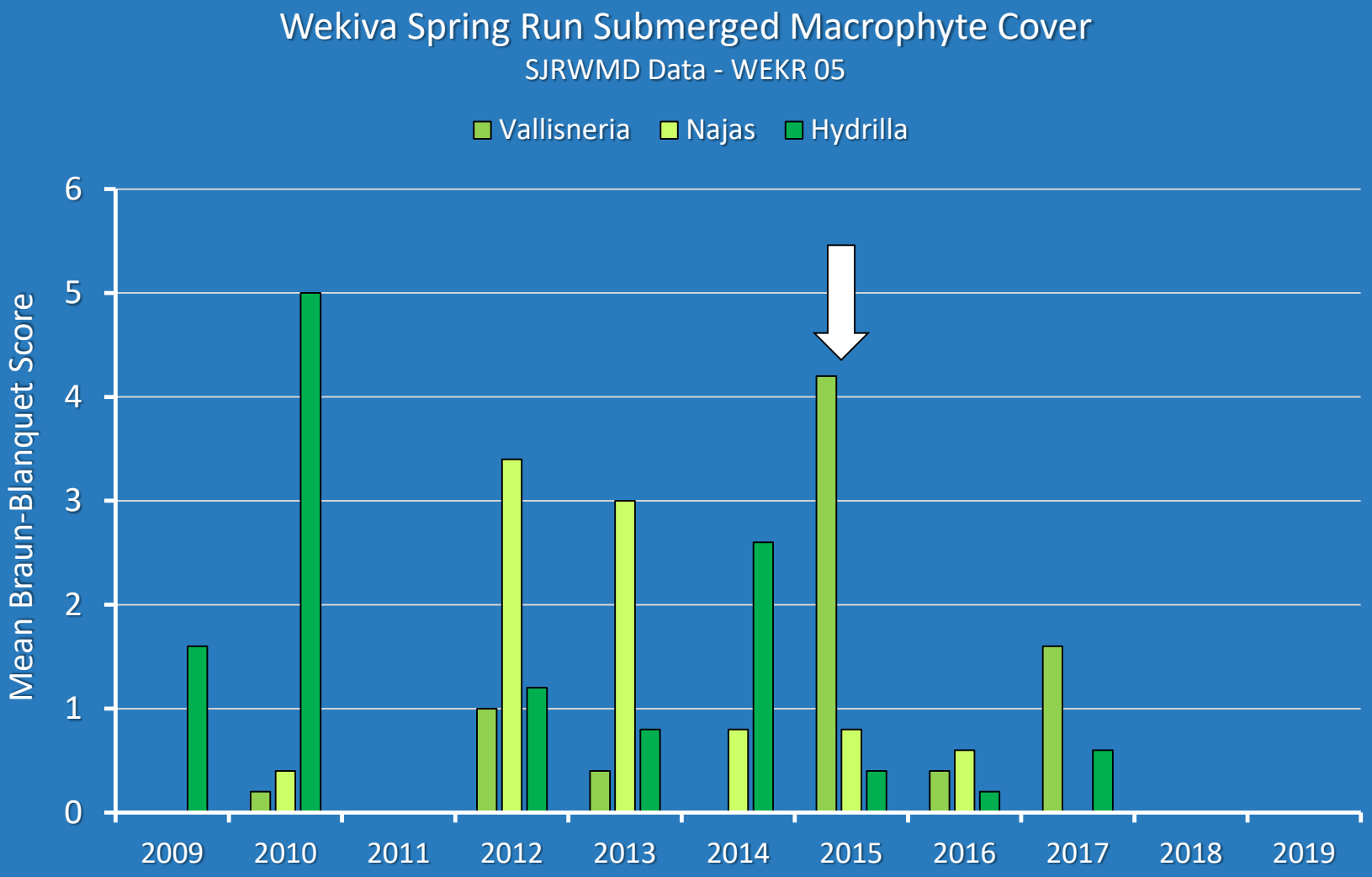
Submerged Macrophytes



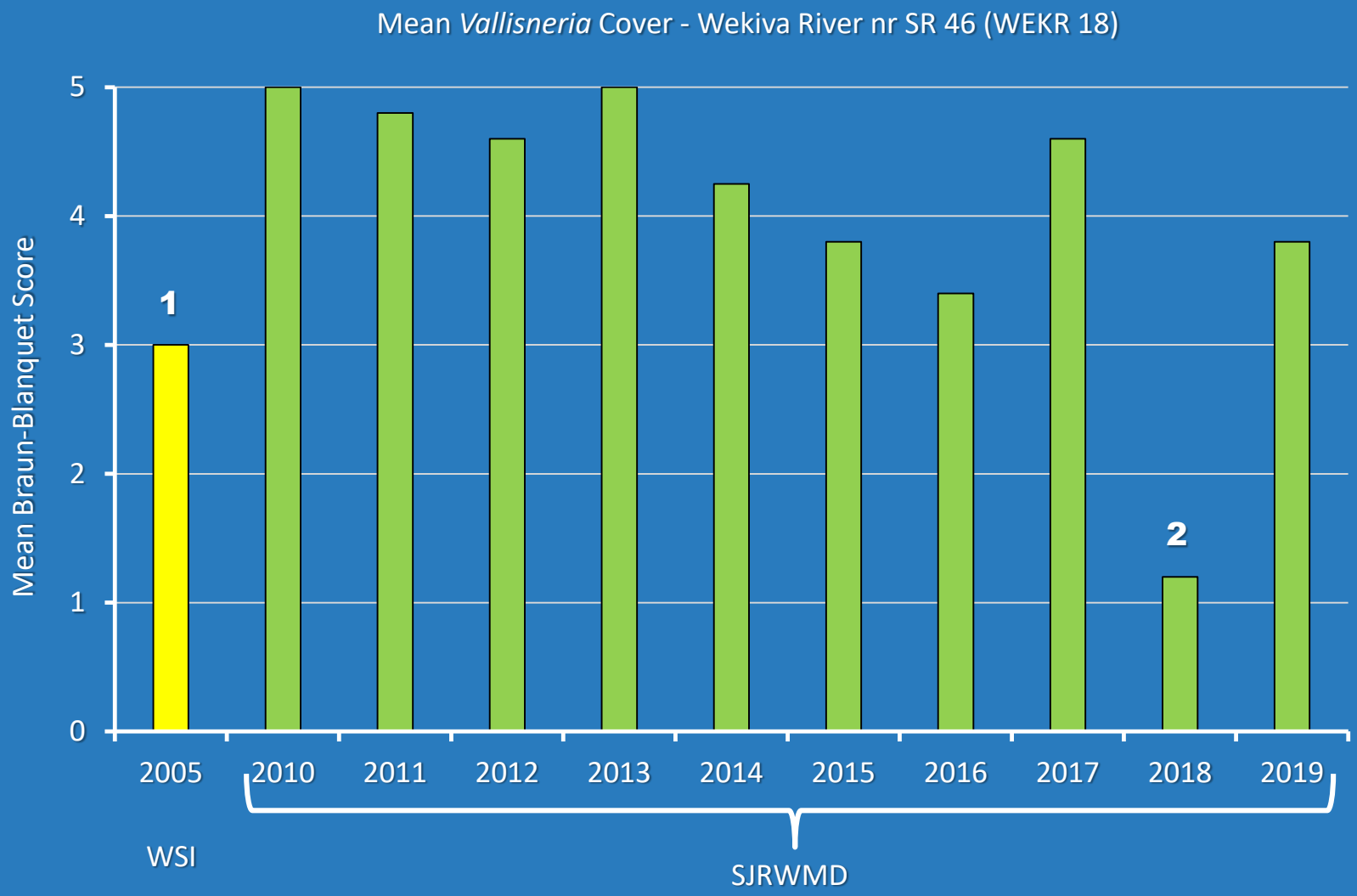
Submerged Macrophytes



Submerged Macrophytes



Submerged Macrophytes



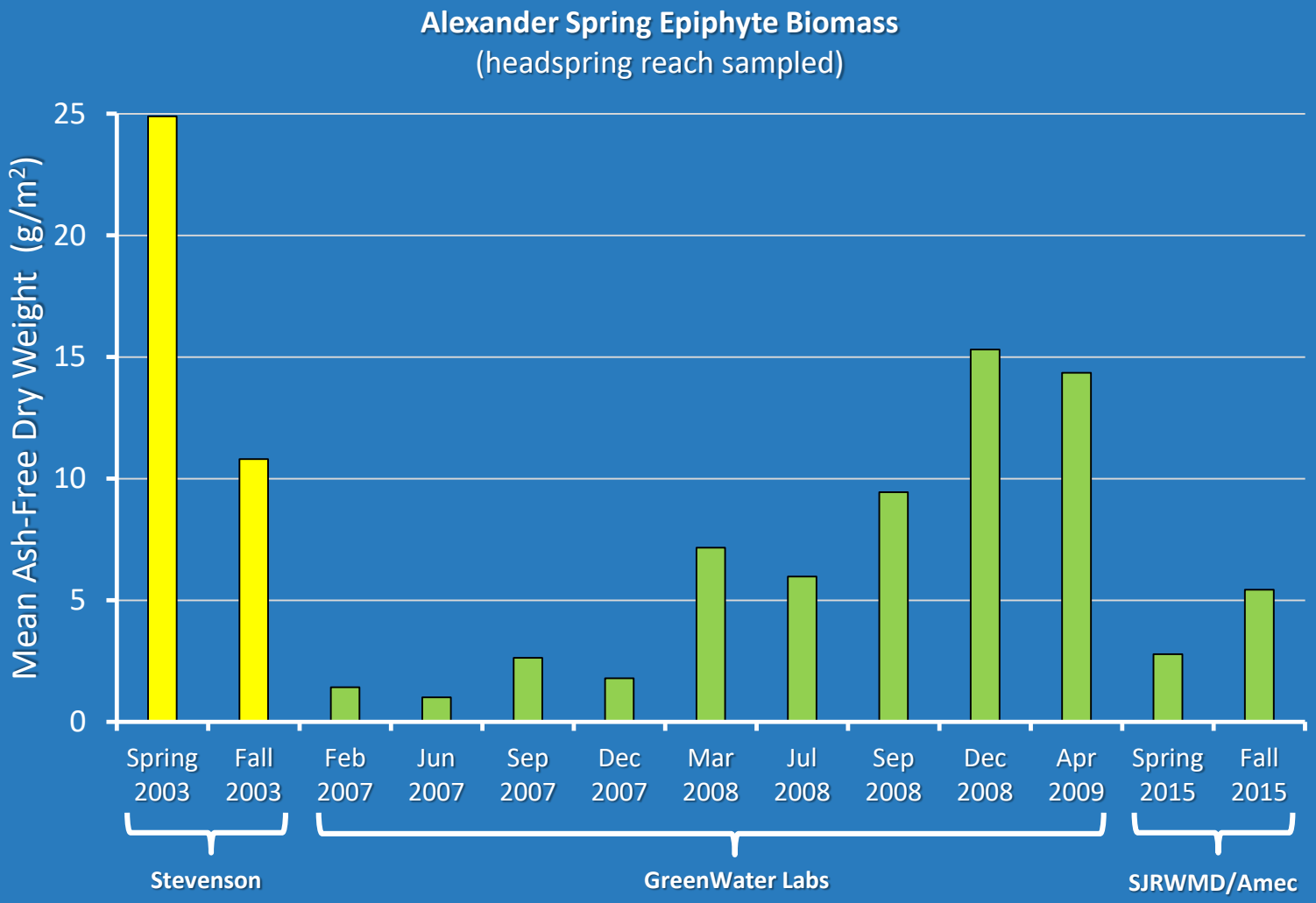
1 – Hurricanes Charley, Frances & Jean in 2004; **2** – Hurricane Irma in 2017

Quantitative Algal Studies

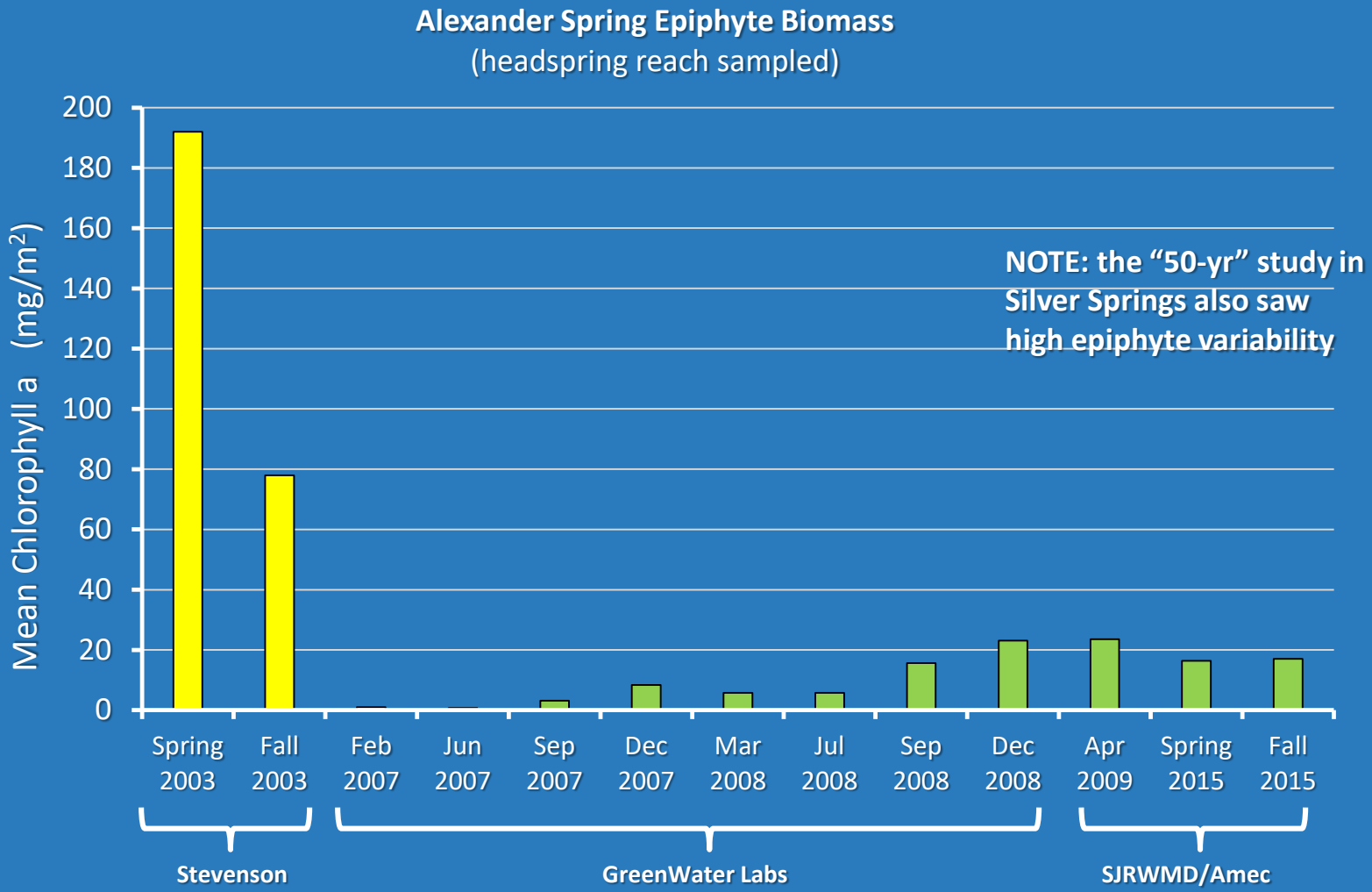
(Published studies)

	Stevenson et al. 2003	GW Labs 2007-09	SJRWMD/Amec 2015
Wakulla River	XX		XX
Wacissa River	XX		XX
Ichetucknee River	XX		XX
Manatee Spring	XX		XX
Rainbow River	XX		XX
Weeki Wachee River	XX		XX
Silver River	XX		XX
Rock Springs Run		XX	XX
Silver Glen Spring	XX	XX	XX
Juniper Creek	XX	XX	XX
Volusia Blue Spring	XX		XX
Alexander Springs Creek	XX	XX	XX
Wekiva River	XX	XX	XX

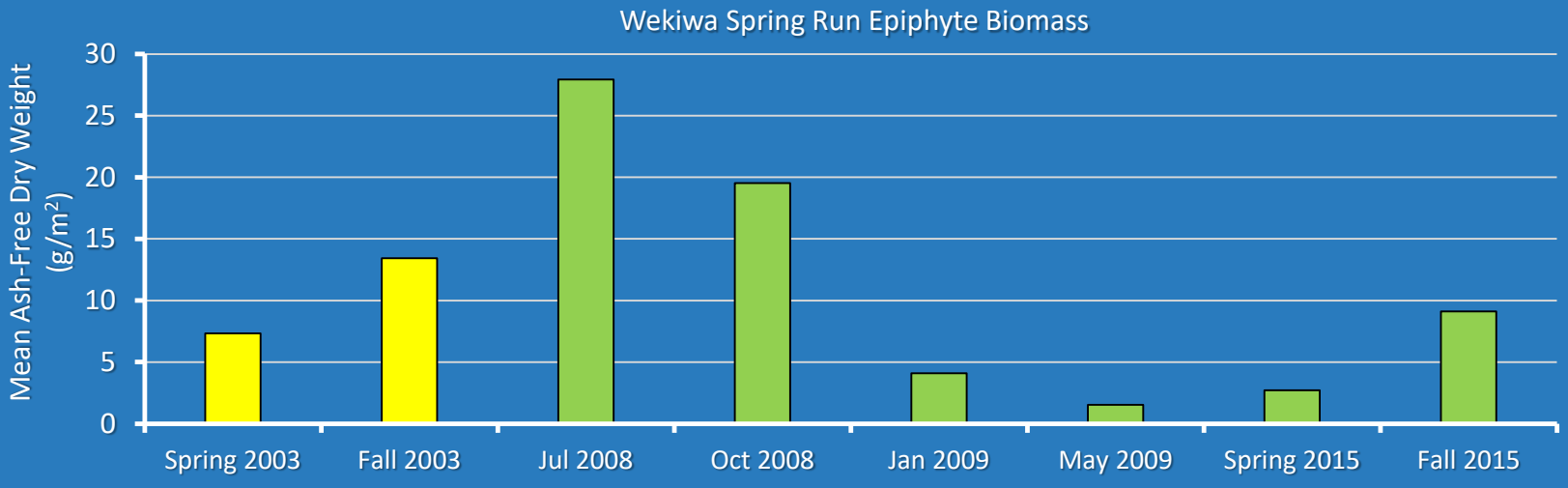
Epiphytic Algae

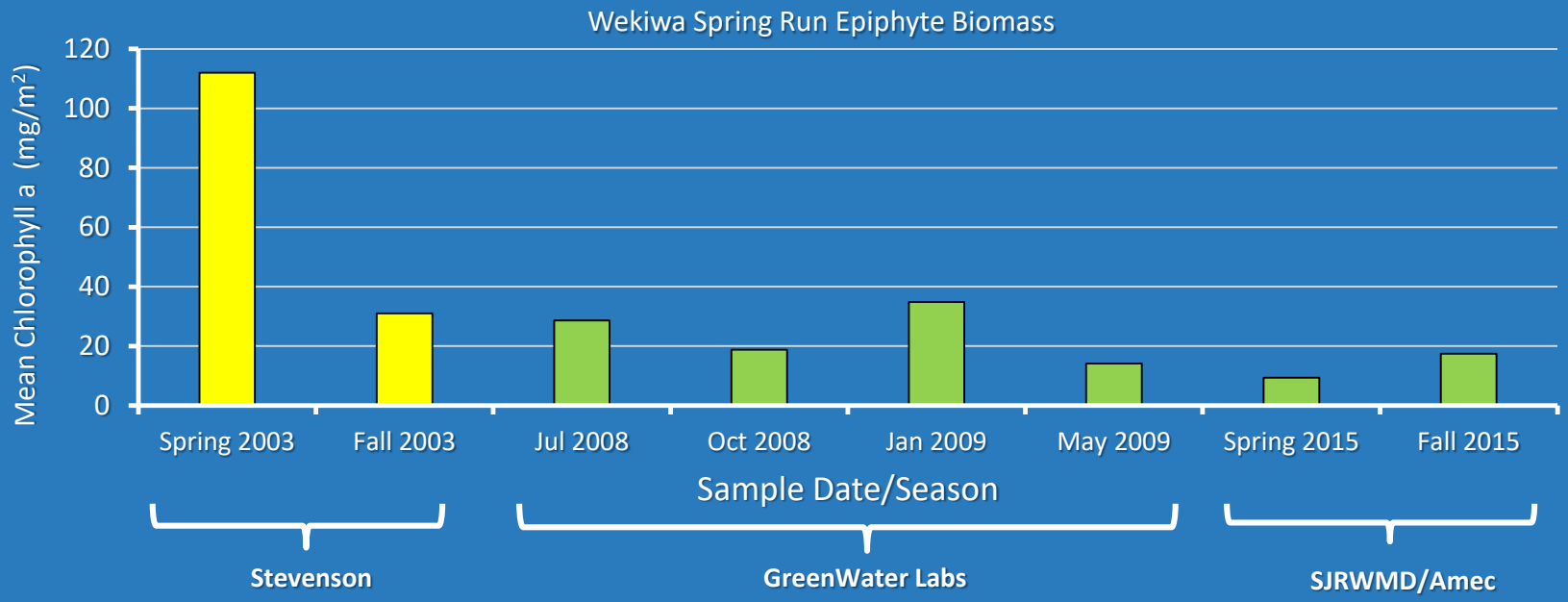


Epiphytic Algae

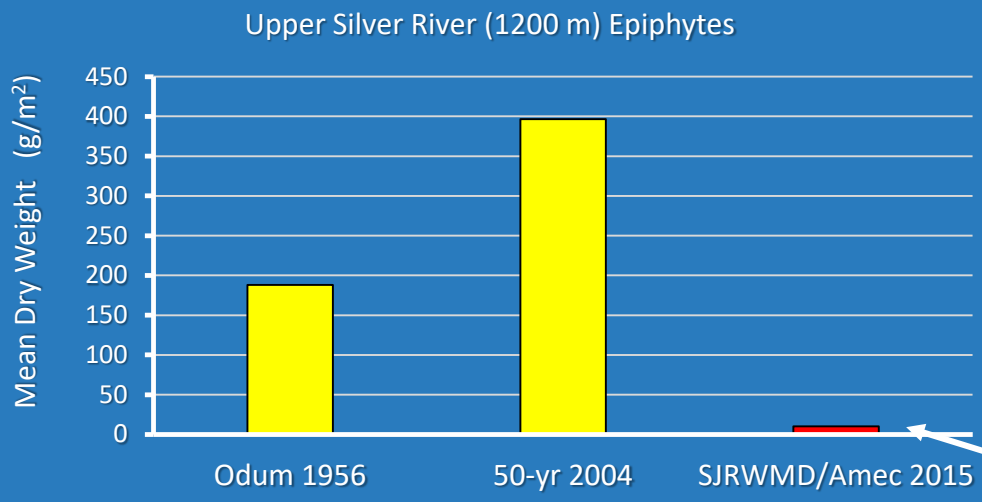


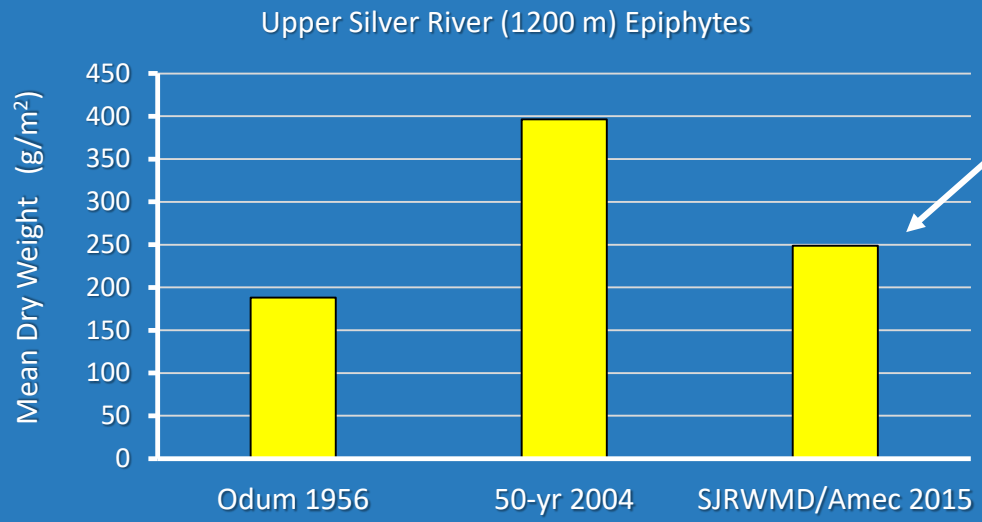
Epiphytic Algae





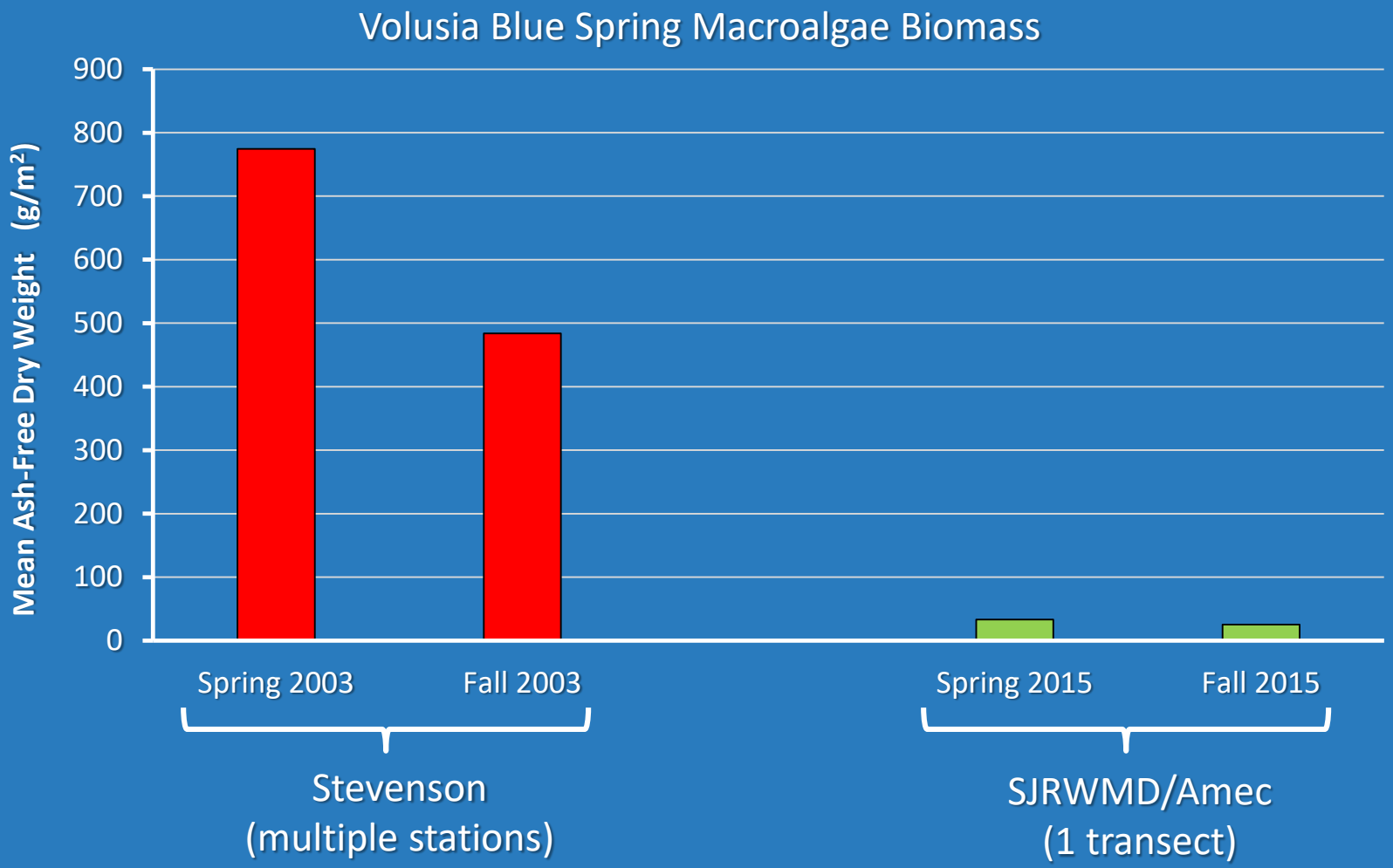
Epiphytic Algae



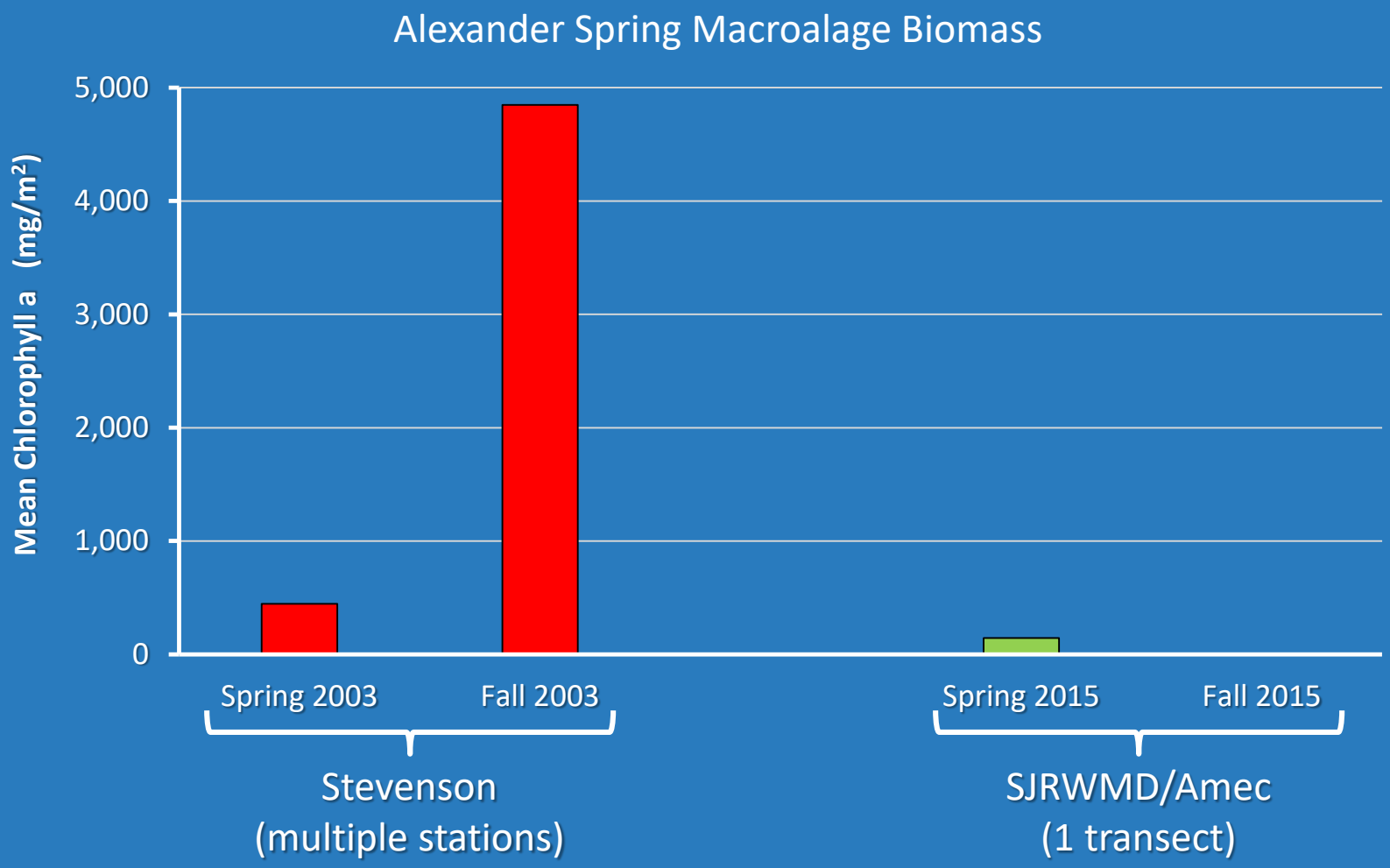


Epiphyte DW on blades x 24.3 m^2 of blade surface area per m^2 of bottom

Macroalgae

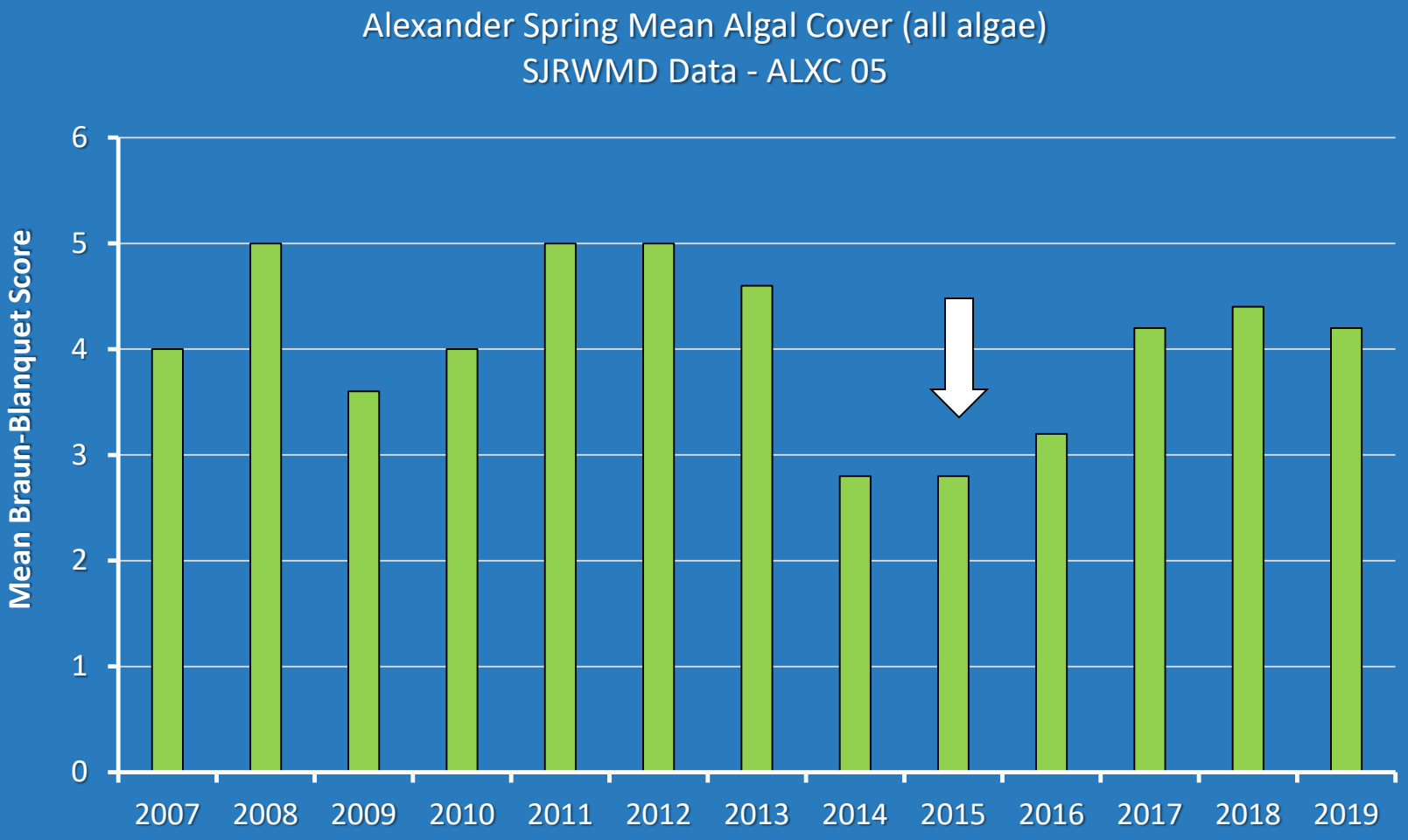

Volusia Blue Spring Macroalgae Biomass
Mean Ash-Free Dry Weight (g/m²)
900
800
700
600
500
400
300
200
100
0
Spring 2003
Fall 2003
Spring 2015
Fall 2015
Stevenson
(multiple stations)
SJRWMD/Amec
(1 transect)

Macroalgae

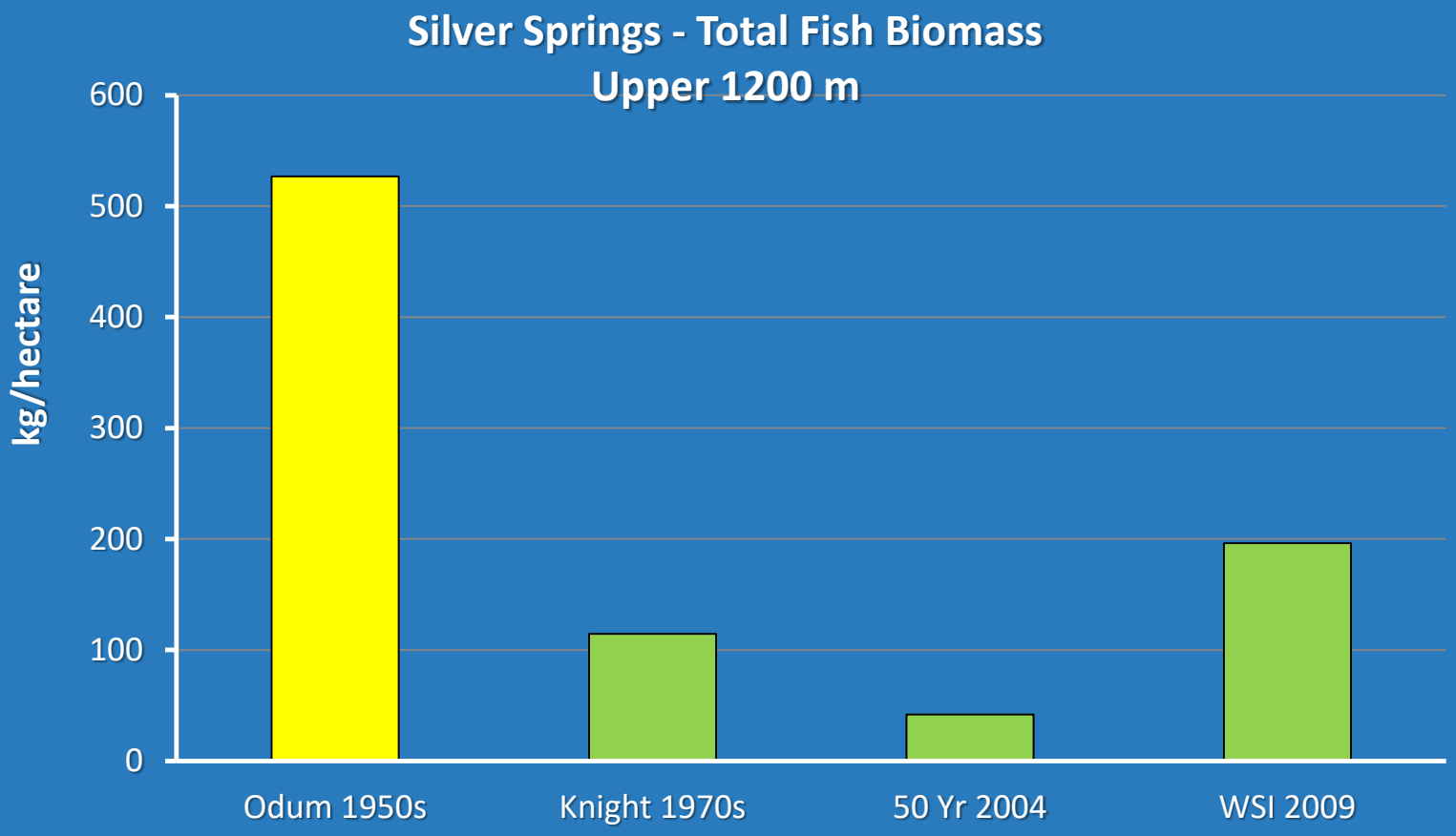

Alexander Spring Macroalage Biomass
Mean Chlorophyll a (mg/m²)
5,000
4,000
3,000
2,000
1,000
0
Spring 2003
Fall 2003
Spring 2015
Fall 2015
Stevenson
(multiple stations)
SJRWMD/Amec
(1 transect)

All Algae

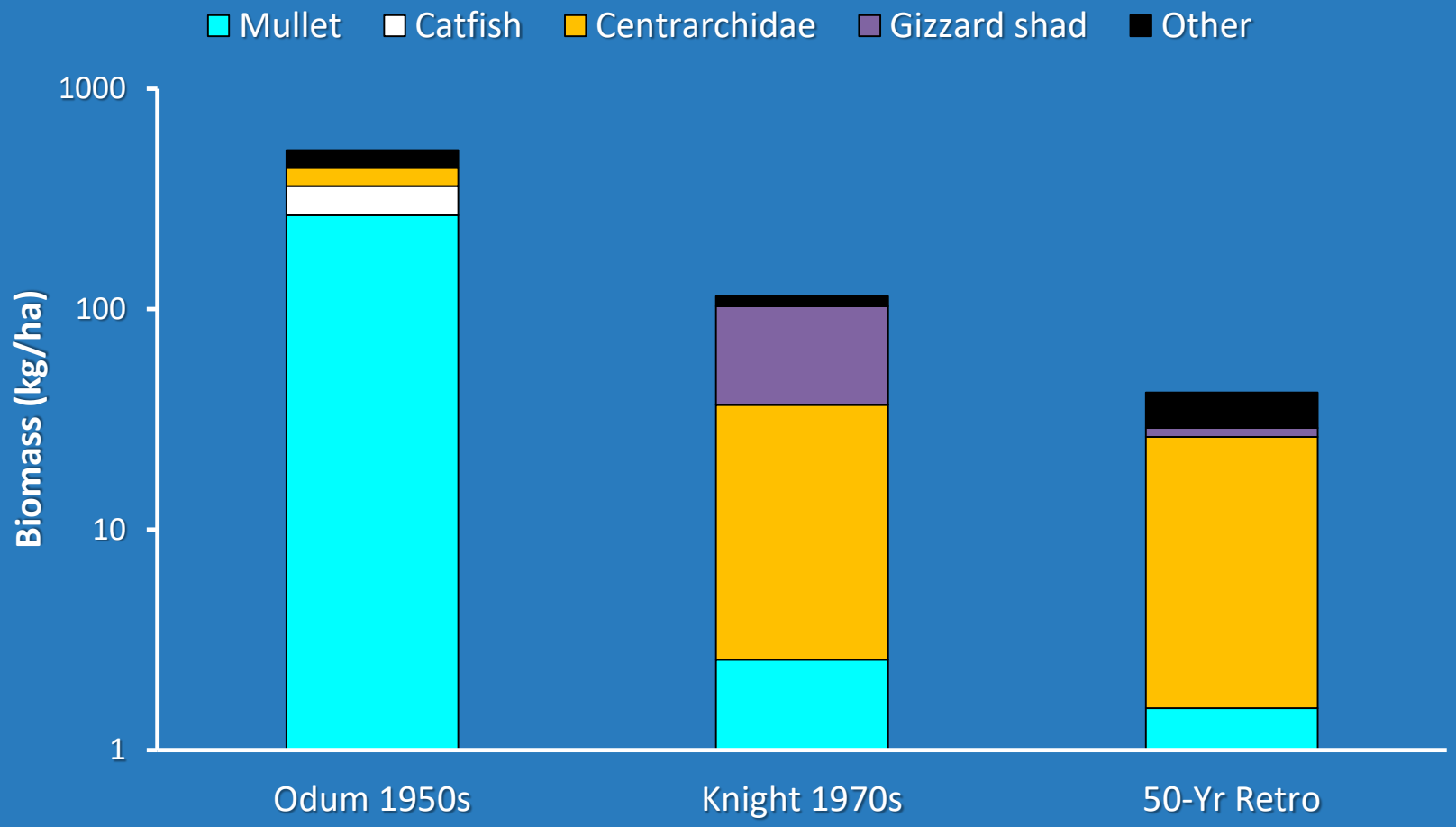
(Epiphytes and macroalgae)



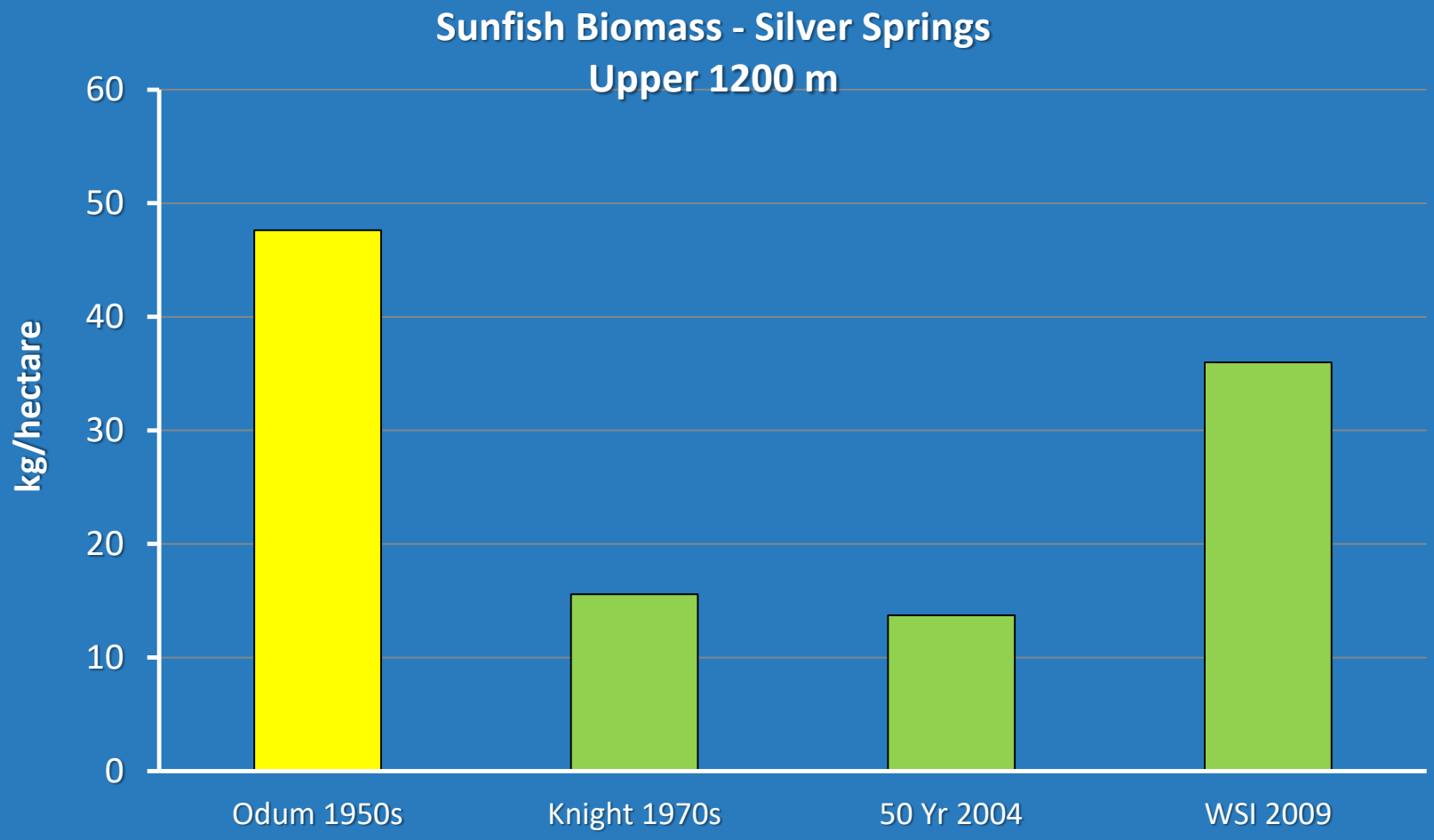
Fish Community



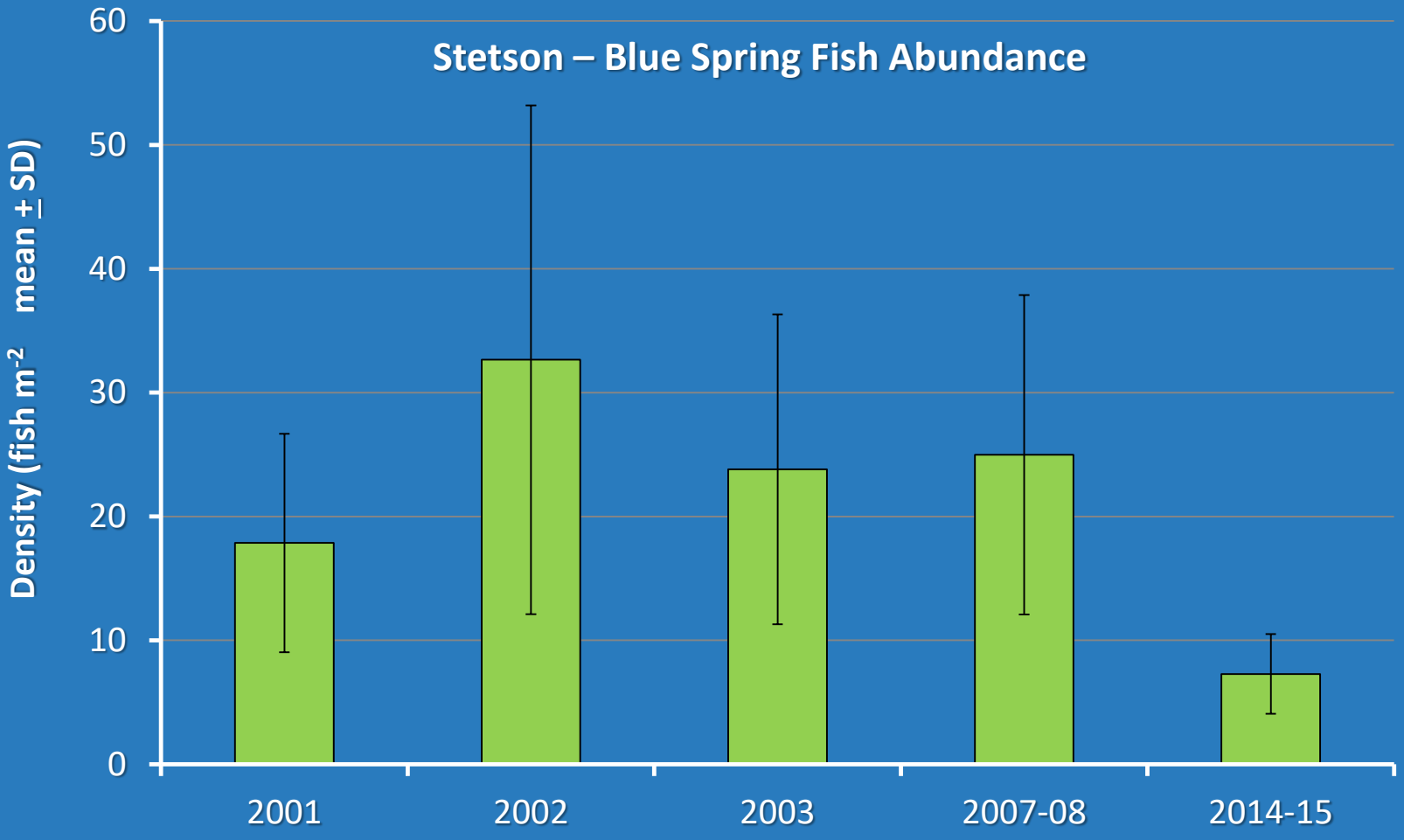
Silver Springs Fish Community



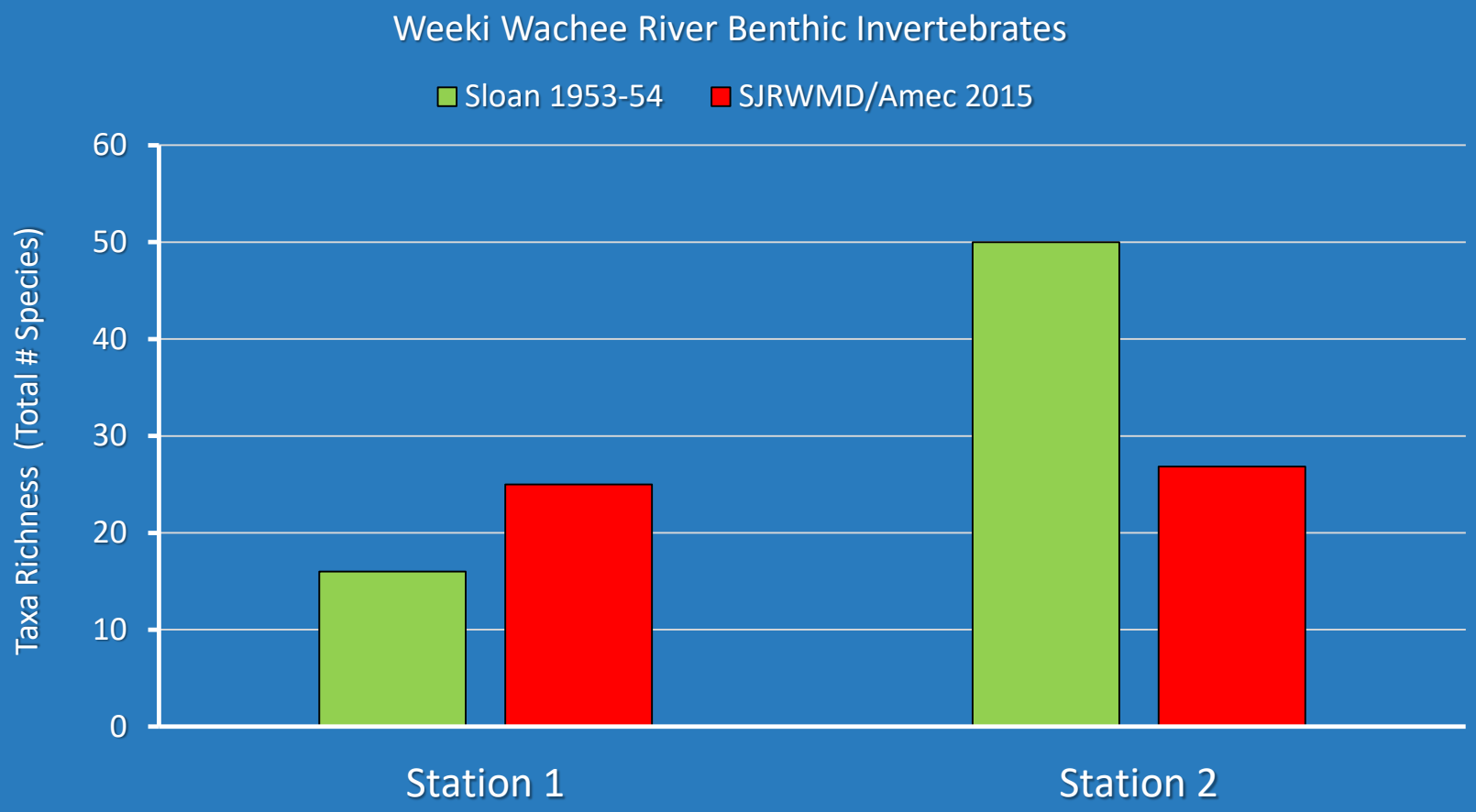
Silver Springs Fish Community



Fish Community

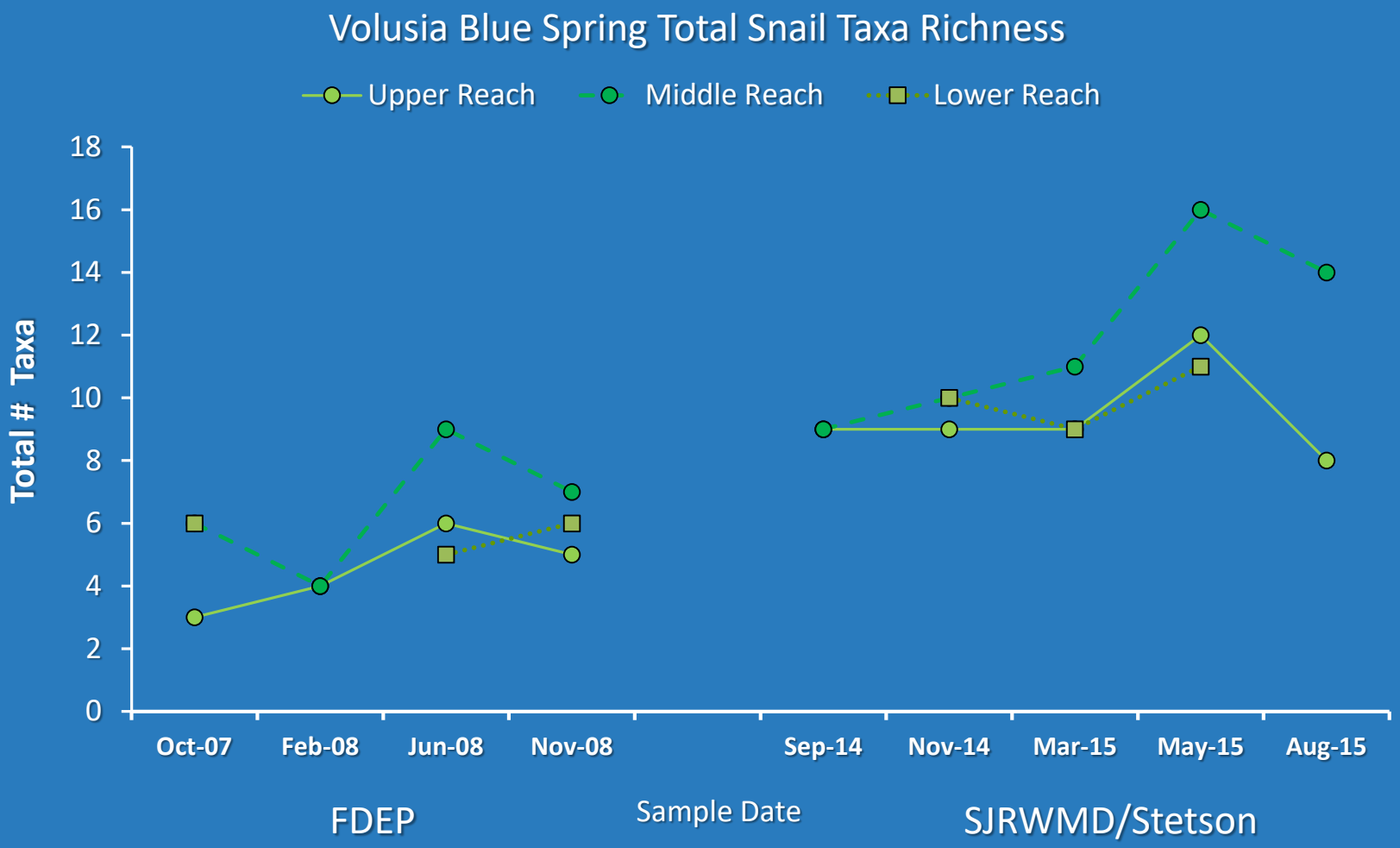


Benthic Macroinvertebrates

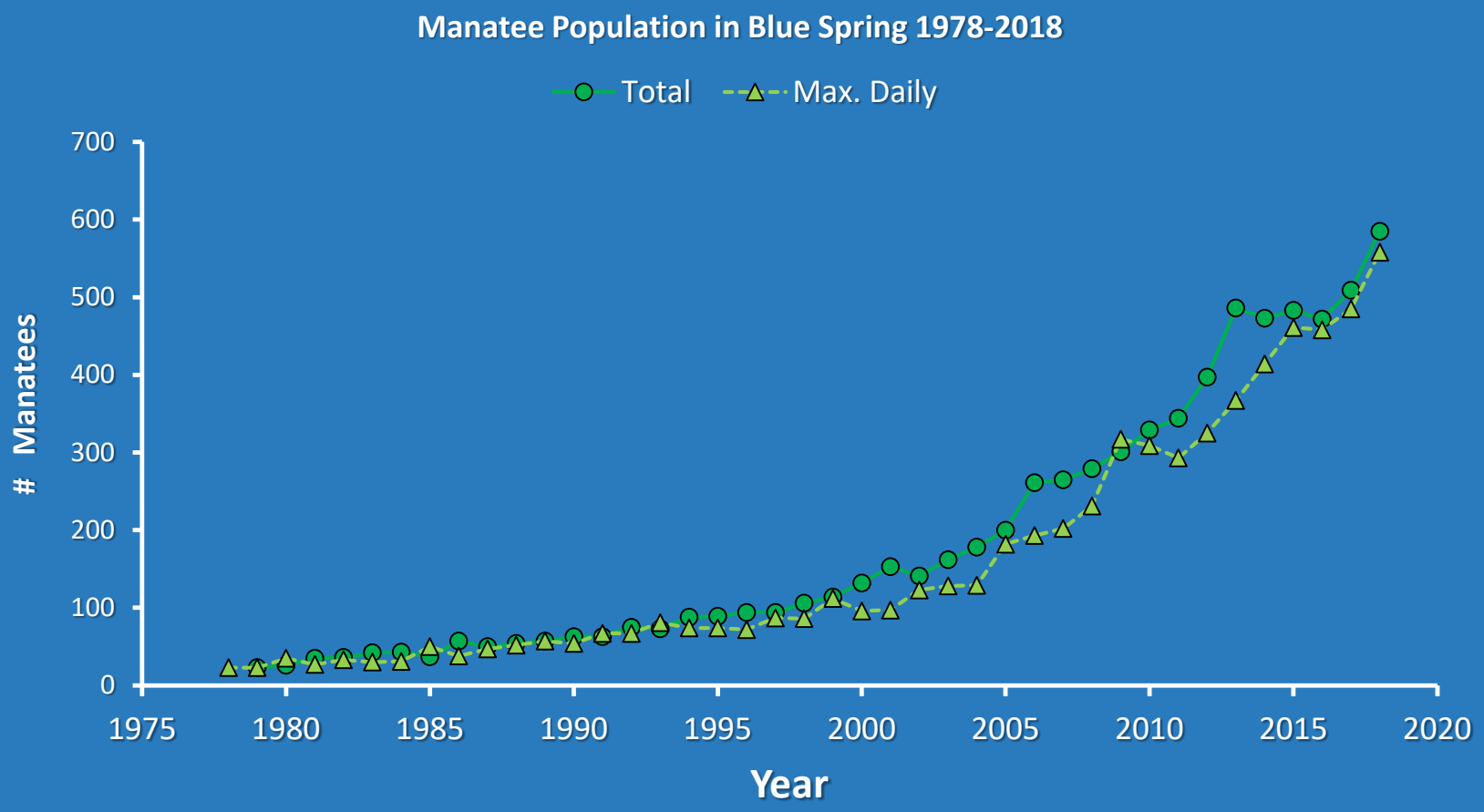


Collection methods different; stations not in exact same location

Benthic Macroinvertebrates



Florida Manatee



Data: Fla. Park Service and Save the Manatee Club

Common Findings

- No understanding of long-term biological trends in spring-run streams.
- Submerged macrophyte abundance (as g DW/m^2); mixed trends. Are there less macrophytes in springs? For some, “Yes”, others, “No”.
- High variability in epiphytic algal abundance; mixed trends across systems. Is there more algae in springs? Can’t really say from the data; one result suggests “Yes”.

Common Findings

- Fish abundance highly variable; some changes in community composition. Are there more or less fish in Florida spring-run streams? Hard to say from the data, so “Inconclusive”. Have fish communities changed? Tentatively, “Yes”.

- Benthic macroinvertebrates; very little historic data. Have benthic communities in springs changed? “Inconclusive”.

Common Findings

- Manatee abundance at Blue Spring during winter season well-tracked; good understanding of long-term trends. Are manatee populations doing well? In northeast Florida, “Yes”.

- Biological monitoring data are important to better understand what’s happening in springs; people see the biology.

Biological Studies in Florida Spring-Run Streams Current

- Various investigators 1999-current – turtle surveys (Wekiva R., V. Blue Spring, G. Blue Spring/Santa Fe R.)
- Work and Gibbs (Stetson) 2001-current – fish population surveys in Volusia Blue Spring
- DEP Parks 1989-current – vegetation monitoring in Ichetucknee River; 1978-current – manatee monitoring in Volusia Blue Spring
- SJRWMD 2007-current – SAV (macrophytes and algae) surveys in SJR spring-run streams
- Florida Springs Institute 2011-current – ecological monitoring in priority spring-run streams

Conclusions

- It's the Biology, stx#&d !
- Need biological monitoring to support hydrologic and water quality data
- Need to agree on standard methodologies so we can compare data among springs and over time
- What do you want to know? This drives what data you collect (Mapping? Field sampling?)

Thank you

www.sjrwmd.com/springs